Complete Summary

GUIDELINE TITLE

(1) ACC/AHA guideline update on perioperative cardiovascular evaluation for noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). (2) ACC/AHA 2006 guideline update on perioperative cardiovascular evaluation for noncardiac surgery: focused update on perioperative beta-blocker therapy.

BIBLIOGRAPHIC SOURCE(S)

American College of Cardiology Foundation (ACCF), American Heart Association (AHA). ACC/AHA guideline update on perioperative cardiovascular evaluation for noncardiac surgery. A report of the American College of Cardiology/American Heart Association Task Force on practice guidelines (Committee to Update the 1996 Guidelines). Bethesda (MD): American College of Cardiology Foundation; 2002. 58 p. [390 references]

Fleisher LA, Beckman JA, Freeman WK, Brown KA, Froeclich JB, Calkins H, Kasper EK, Chaikof E, Kersten JR, Fleischmann KE, Riegel B. ACC/AHA 2006 guideline update on perioperative cardiovascular evaluation on noncardiac surgery: focused update on perioperative beta-blocker therapy. A report of the American College of Cardiology/American Heart Association Task Force on Practice [trunc]. J Am Coll Cardiol 2006;47:1-12. [25 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline combined with the addended material, updates a previous version: Guidelines for perioperative cardiovascular evaluation for noncardiac surgery: report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 1996 Jun;27[4]:910-48.

COMPLETE SUMMARY CONTENT

IDENTIFYING INFORMATION AND AVAILABILITY
DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

- Cardiovascular diseases, including:
  - Coronary artery disease
  - Myocardial infarction
  - Angina pectoris
  - Heart failure
  - Symptomatic arrhythmias
  - Conduction defects
  - Hypertension
  - Cardiomyopathy
  - Valvular heart disease
  - Pulmonary vascular disease
  - Presence of implanted pacemakers and implantable cardioverter defibrillators

GUIDELINE CATEGORY

Evaluation
Management
Risk Assessment

CLINICAL SPECIALTY

Anesthesiology
Cardiology
Emergency Medicine
Family Practice
Internal Medicine
Nuclear Medicine
Surgery

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

- To provide a framework for considering cardiac risk of noncardiac surgery in a variety of patients and surgical situations
- To guide preoperative evaluation to determine the patient's current medical status
- To make recommendations concerning the evaluation, management and risk of cardiac problems over the entire perioperative period, and

- To provide a clinical risk profile that the patient, his or her primary physician, anesthesiologist, and surgeon can use in making treatment decisions that may influence short- and long-term cardiac outcomes
- To update recommendations concerning beta-blockade that can be used in national quality initiatives

TARGET POPULATION

Patients undergoing noncardiac surgery

INTERVENTIONS AND PRACTICES CONSIDERED

Risk Assessment

1. Clinical history
2. Physical examination
3. Stepwise approach to perioperative cardiac assessment (clinical markers, prior coronary evaluation and treatment, functional capacity, and surgery-specific risk)
4. Supplemental preoperative evaluation:
    - Resting left ventricular function
    - 12-lead electrocardiogram
    - Exercise or pharmacological stress testing
    - Myocardial perfusion imaging
    - Dobutamine stress echocardiography
    - Ambulatory electrocardiogram monitoring
    - Coronary angiography

Management

1. Perioperative therapy
    - Surgical coronary revascularization: preoperative coronary artery bypass grafting (CABG); percutaneous transluminal coronary angioplasty (PTCA)
    - Pharmacologic management: beta-blocker, alpha-2 agonist therapy
2. Management of specific preoperative cardiovascular conditions
3. Anesthetic considerations and intraoperative management, including choice of anesthetic technique and agent, perioperative pain management, use of intraoperative nitroglycerin, transesophageal echocardiography, maintaining body temperature, and use of intra-aortic balloon counterpulsation devices
4. Perioperative surveillance, including use of intraoperative pulmonary artery catheters, ST-segment monitoring, and surveillance for perioperative myocardial infraction
5. Postoperative and long-term management

MAJOR OUTCOMES CONSIDERED

- Positive and negative predictive value of tests for myocardial infarction or death
- Short- and long term cardiac outcomes, such as perioperative cardiovascular morbidity (e.g., myocardial infarction) and mortality (e.g., cardiac death)

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The American College of Cardiology/American Heart Association Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery conducted a comprehensive review of the literature relevant to perioperative cardiac evaluation since the last publication of these guidelines in 1996. Literature searches were conducted in the following databases: PubMed/MEDLINE, EMBASE, the Cochrane Library (including the Cochrane Database of Systematic Reviews and the Cochrane Controlled Trials Register), and Best Evidence (American College of Physicians-American Society of Internal Medicine). Searches were limited to the English language, 1995 through 2000, and human subjects. In addition, related-article searches were conducted in MEDLINE to find further relevant articles. Finally, committee members recommended applicable articles outside the scope of the formal searches.

Major search topics included perioperative risk, cardiac risk, noncardiac surgery, noncardiac, intraoperative risk, postoperative risk, risk stratification, cardiac complication, cardiac evaluation, perioperative care, preoperative evaluation, preoperative assessment, and intraoperative complications. Additional searches cross-referenced these topics with the following subtopics: troponin, myocardial infarction, myocardial ischemia, Duke activity status index, functional capacity, dobutamine, adenosine, venous thrombosis, thromboembolism, warfarin, percutaneous transluminal coronary angioplasty (PTCA), adrenergic beta-agonists, echocardiography, anticoagulant, beta-blocker, diabetes mellitus, wound infection, blood sugar control, normothermia, body temperature changes, body temperature regulation, hypertension, pulmonary hypertension, anemia, aspirin, arrhythmia, implantable defibrillator, artificial pacemaker, pulmonary artery catheters, Swan Ganz catheter, and platelet aggregation inhibitors.

2006 Update

Literature searches were conducted in PubMed/MEDLINE. Searches were limited to the English language, 2002 through 2006, and human subjects. In addition, related-article searches were conducted in MEDLINE to find further relevant articles. Finally, committee members recommended applicable articles outside the scope of the formal searches.

NUMBER OF SOURCE DOCUMENTS

400 relevant, new articles were identified and reviewed by the committee for the update of the guideline.

2006 Update

23 published articles and 1 abstract were identified and reviewed by the committee for the expedited update of the Beta-Blocker section.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Highest priority given to randomized trials; second highest priority given to observational database reports; lowest priority given to expert opinion.

2006 Update

The weight of evidence in support of the recommendation is listed as follows:

- Level of Evidence A: Data derived from multiple, randomized, clinical trials.
- Level of Evidence B: Data derived from a single randomized trial or non-randomized studies.
- Level of Evidence C: Only consensus opinion of experts, case studies, or standard-of-care.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

The committee conducted a systematic review with thorough evaluation of available clinical data and compilation of these data into six evidence tables.

2006 Update

The Committee to Update the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery: Focused Update on Perioperative Beta-Blocker Therapy reviewed the literature relevant to perioperative cardiac evaluation since the last publication of these guidelines in 2002.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Experts in the subject under consideration are selected from the American College of Cardiology (ACC) and the American Heart Association (AHA) to examine subject-specific data and write guidelines. The process includes additional representatives from other medical specialty groups when appropriate. Writing

groups are specifically charged to perform a formal literature review, weigh the strength of evidence for or against a particular treatment or procedure, and include estimates of expected health outcomes where data exist. Patient-specific modifiers, comorbidities, and issues of patient preference that might influence the choice of particular tests or therapies are considered as well as frequency of follow-up and cost-effectiveness.

2006 Update

Using evidence-based methodologies developed by the ACC/AHA Task Force on Practice Guidelines, the Committee to Update the 2002 Guidelines on Perioperative Evaluation for Noncardiac Surgery: Focused Update on Perioperative Beta-Blocker Therapy updated the guideline text and recommendations for the 2006 update on beta-blockers.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Class I: Conditions for which there is evidence for and/or general agreement that the procedure or treatment is beneficial, useful, and effective.

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment.

> Class IIa: Weight of evidence/opinion is in favor of usefulness/efficacy.
>
> Class IIb: Usefulness/efficacy is less well established by evidence/opinion.

Class III: Conditions for which there is evidence and/or general agreement that the procedure/treatment is not useful/effective and in some cases may be harmful.

COST ANALYSIS

Implications of Risk Assessment Strategies for Costs

The decision to recommend further noninvasive or invasive testing for the individual patient being considered for noncardiac surgery ultimately becomes a balancing act between the estimated probabilities of effectiveness vs. risk. The proposed benefit, of course, is the possibility of identifying advanced but relatively unsuspected coronary artery disease (CAD) that might result in significant cardiac morbidity or mortality either perioperatively or in the long term. In the process of further screening and treatment, the risks from the tests and treatments themselves may offset or even exceed the potential benefit of evaluation. Furthermore, the cost of screening and treatment strategies must be considered. Although physicians should be concerned with improving the clinical outcome of their patients, cost is an appropriate consideration when different evaluation and treatment strategies are available that cannot be distinguished from one another in terms of clinical outcome.

Formal decision and cost-effectiveness analyses of this particular question have been done and have yielded highly varied results. Because the exact amount of risk reduction from coronary revascularization in the clinical populations differs so much from center to center, it is difficult to determine the exact risks of aggressive screening and treatments vs. the benefits in terms of risk reduction. Additionally, the models all demonstrate that optimal strategy depends on the mortality rates for both cardiac procedures and noncardiac surgeries in the clinically relevant range. One decision model, which did not support a strategy incorporating coronary angiography and revascularization, used lower mortality rates than those used or reported in the other studies. Therefore, use of any decision and cost-effectiveness model in a specific situation depends on the comparability of local mortality rates to those of the model.

One report suggested that the cost of a selected coronary screening approach, as described in these guidelines, was as low as $214 per patient. Several recent publications have shown a cost per year of life saved for this selected screening strategy of less than $45,000 when applied to patients undergoing vascular surgery. However, none of these studies included a strategy of selected screening followed by aggressive beta-blocker treatment in high-risk individuals, as recently described by Poldermans and colleagues. It is likely that this approach will be preferred over more aggressive coronary assessment/treatment strategies except perhaps among very high-risk subsets of patients. Prophylactic beta-blockade represents an excellent strategy in patients for whom coronary revascularization for long-term benefit is not a serious consideration.

Postoperative and Long-Term Management

In general, the indications for additional screening or testing in postoperative patients depend on individual patient characteristics. A recent decision-tree model was constructed to compare cost-effectiveness of various preoperative screening protocols in postoperative vascular surgery patients for up to 5 years after discharge. The best event-free survival and cost-effectiveness ratio were noted for selective preoperative stress testing (using dipyridamole-thallium imaging) in patients with intermediate clinical risk, whereas high-risk patients were referred to coronary angiography and low-risk patients were sent to elective surgery without further workup. This is the general approach suggested in these guidelines.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

This document was reviewed by two outside reviewers from the American Heart Association (AHA) and 2 outside reviewers of the American College of Cardiology (ACC), as well as 1 reviewer of the ACC/AHA Task Force on Practice Guidelines. It was approved by the ACC Board of Trustees and the AHA Science Advisory and Coordinating Committee.

2006 Update

The document was reviewed by 2 official reviewers nominated by the ACC; 2 official reviewers nominated by the AHA; 1 official reviewer from the ACC/AHA Task Force on Practice Guidelines as well as reviewers from the Society for Vascular Medicine and Biology, American Society of Nuclear Cardiology, Heart Rhythm Society, American Society of Echocardiography, Society of Cardiovascular Anesthesiologists, and the Society for Cardiovascular Angiography and Interventions; and 20 content reviewers, including members from American College of Cardiology Foundation (ACCF) Cardiac Catheterization Committee, ACCF Peripheral Vascular Disease Committee, ACCF Cardiovascular Clinical Imaging Committee, ACCF Echocardiography Committee, ACCF Clinical Electrophysiology Committee, AHA Council on Cardiopulmonary Perioperative and Critical Care Leadership Committee, AHA Council on Cardiovascular Surgery and Anesthesia Leadership Committee, and the AHA Council on Clinical Cardiology, Electrocardiography, and Arrhythmias Committee.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Note from the National Guideline Clearinghouse (NGC) and the American College of Cardiology/American Heart Association (ACC/AHA) Task Force on Practice Guidelines: NGC has revised the section on Perioperative Medical Therapy with beta blockers to reflect the 2006 ACC/AHA update (see below). All other recommendations from the 2002 version of the guideline remain unchanged and represent current ACC/AHA policy.

Explanation of classification system for the guideline recommendations and the levels of evidence (2006 update) is provided at the end of the "Major Recommendations" field.

General Approach

The preoperative cardiac evaluation must be carefully tailored to the circumstances that have prompted the consultation and to the nature of the surgical illness (e.g., acute surgical emergency) as opposed to urgent or elective cases. Successful perioperative evaluation and treatment of cardiac patients undergoing noncardiac surgery requires careful teamwork and communication between the patient, primary care physician, anesthesiologist, consultant, and surgeon. In general, indications for further cardiac testing and treatments are the same as those in the nonoperative setting, but their timing is dependent on such factors as the urgency of noncardiac surgery, the patient's risk factors, and specific surgical considerations. Coronary revascularization before noncardiac surgery to enable the patient to "get through" the noncardiac procedure is appropriate only for a small subset of patients at very high risk. Preoperative testing should be limited to circumstances in which the results will affect patient treatment and outcomes. A conservative approach to the use of expensive tests and treatments is recommended.

Preoperative Clinical Evaluation

The initial history, physical examination, and electrocardiogram (ECG) assessment should focus on identification of potentially serious cardiac disorders, including coronary artery disease (CAD) [e.g., prior myocardial infarction (MI) and angina pectoris], heart failure (HF), symptomatic arrhythmias, presence of pacemaker or implantable cardioverter defibrillator (ICD), or a history of orthostatic intolerance. The presence of anemia may also place a patient at higher perioperative risk.

In addition to identifying the presence of preexisting manifested heart disease, it is essential to define disease severity, stability, and prior treatment. Other factors that help determine cardiac risk include functional capacity, age, comorbid conditions (e.g., diabetes mellitus, peripheral vascular disease, renal dysfunction, and chronic pulmonary disease), and type of surgery (vascular procedures and prolonged, complicated thoracic, abdominal, and head and neck procedures are considered higher risk).

Numerous risk indices have been developed over the past 25 years on the basis of multivariate analyses. In addition to the presence of CAD and heart failure, a history of cerebrovascular disease, preoperative elevated creatinine greater than 2 mg per deciliter, insulin treatment for diabetes mellitus, and high-risk surgery have all been associated with increased perioperative cardiac morbidity. Despite these risk indices, there was consensus among the committee members to place clinical risk factors into 3 categories of predictors (see the section titled "Clinical Markers," below).

Further Preoperative Testing to Assess Coronary Risk

Which patients are most likely to benefit from preoperative coronary assessment and treatment? The lack of adequately controlled or randomized clinical trials to define the optimal evaluation strategy led to the proposed algorithm based on collected observational data and expert opinion (see Figure 1, Stepwise Approach to Preoperative Cardiac Assessment, in the original guideline document). Since publication of the guidelines in 1996, several studies have suggested that this stepwise approach to the assessment of CAD is both efficacious and cost-effective.

A stepwise Bayesian strategy that relies on assessment of clinical markers, prior coronary evaluation and treatment, functional capacity, and surgery-specific risk is outlined in Figure 1 in the original guideline document. A framework for determining which patients are candidates for cardiac testing is presented in algorithmic form (see Figure 1, Stepwise Approach to Preoperative Cardiac Assessment, in the original guideline document). Successful use of the algorithm requires an appreciation of the different levels of risk attributable to certain clinical circumstances, levels of functional capacity, and types of surgery. These are defined below, after which the algorithm is reviewed step by step.

Clinical Markers

The major clinical predictors (see Table 1, below) of increased perioperative cardiovascular risk are a recent unstable coronary syndrome such as an acute MI (documented MI less than 7 days previously), recent MI (more than 7 days but less than 1 month before surgery), unstable or severe angina, evidence of a large ischemic burden by clinical symptoms or noninvasive testing, decompensated heart failure, significant arrhythmias (high-grade atrioventricular block,

symptomatic arrhythmias in the presence of underlying heart disease, or supraventricular arrhythmias with uncontrolled ventricular rate), and severe valvular disease.

Intermediate predictors of increased risk are mild angina pectoris, a more remote prior MI (more than 1 month before planned surgery), compensated heart failure, preoperative creatinine greater than or equal to 2.0 mg per deciliter, and diabetes mellitus. Minor predictors of risk are advanced age, abnormal ECG, rhythm other than sinus, low functional capacity, history of stroke, and uncontrolled systemic hypertension.

A history of MI or abnormal Q waves by ECG is listed as an intermediate predictor, whereas an acute MI (defined as at least 1 documented MI less than or equal to 7 days before the examination) or recent MI (more than 7 days but less than or equal to 1 month before the examination) with evidence of important ischemic risk by clinical symptoms or noninvasive study is a major predictor. This definition reflects the consensus of the American College of Cardiology Cardiovascular Database Committee. In this way, the separation of MI into the traditional 3- and 6-month intervals has been avoided. Current management of MI provides for risk stratification during convalescence. If a recent stress test does not indicate residual myocardium at risk, the likelihood of reinfarction after noncardiac surgery is low. Although there are no adequate clinical trials on which to base firm recommendations, it appears reasonable to wait 4 to 6 weeks after MI to perform elective surgery.

Table 1. Clinical Predictors of Increased Perioperative Cardiovascular Risk (Myocardial Infarction, Heart Failure, Death)

Major

- Unstable coronary syndromes
    - Acute or recent myocardial infarction* with evidence of important ischemic risk by clinical symptoms or noninvasive study
    - Unstable or severe** angina (Canadian class III or IV)***
- Decompensated heart failure
- Significant arrhythmias
    - High-grade atrioventricular block
    - Symptomatic ventricular arrhythmias in the presence of underlying heart disease
    - Supraventricular arrhythmias with uncontrolled ventricular rate
- Severe valvular disease

Intermediate

- Mild angina pectoris (Canadian class I or II)
- Previous myocardial infarction by history or pathological Q waves
- Compensated or prior heart failure
- Diabetes mellitus (particularly insulin-dependent)
- Renal insufficiency

Minor

- Advanced age
- Abnormal ECG (left ventricular hypertrophy, left bundle-branch block, ST-T abnormalities)
- Rhythm other than sinus (e.g., atrial fibrillation)
- Low functional capacity (e.g., inability to climb one flight of stairs with a bag of groceries)
- History of stroke
- Uncontrolled systemic hypertension

*The American College of Cardiology National Database Library defines recent myocardial infarction (MI) as greater than 7 days but less than or equal to 1 month (30 days); acute myocardial infarction is within 7 days.
**May include "stable" angina in patients who are unusually sedentary.
***Campeau L. Grading of angina pectoris. Circulation 1976;54:522-3.

Functional Capacity

Functional capacity can be expressed in metabolic equivalent (MET) levels (see Table 2, below). Multiples of the baseline metabolic equivalent value can be used to express aerobic demands for specific activities. Perioperative cardiac and long-term risks are increased in patients unable to meet a 4-metabolic equivalent demand during most normal daily activities. The Duke Activity Status Index and other activity scales provide the clinician with a set of questions to determine a patient's functional capacity. Energy expenditures for activities such as eating, dressing, walking around the house, and dishwashing range from 1 to 4 metabolic equivalents. Climbing a flight of stairs, walking on level ground at 6.4 km per hour, running a short distance, scrubbing floors, or playing a game of golf represents 4 to 10 metabolic equivalents. Strenuous sports such as swimming, singles tennis, and football often exceed 10 metabolic equivalents.

Table 2. Estimated Energy Requirements for Various Activities*

1 MET. Can you take care of yourself? Eat, dress, or use the toilet? Walk indoors around the house? Walk a block or two on level ground at 2 to 3 mph or 3.2 to 4.8 km per hour?

4 METs. Do light work around the house like dusting or washing dishes? Climb a flight of stairs or walk up a hill? Walk on level ground at 4 mph or 6.4 km per hour? Run a short distance? Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture? Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?

Greater than 10 METs. Participate in strenuous ports like swimming, singles tennis, football, basketball, or skiing?

*Adapted from the Duke Activity Status Index (Hlatky MA, Boineau RE, Higginbotham MB, et al. A brief self-administered questionnaire to determine functional capacity [the Duke Activity Status Index]. Am J Cardiol 1989;64:651-4.) and American Heart Association Exercise Standards (Fletcher GF, Balady G, Froelicher VF, Hartley LH, Haskell WL, Pollock ML. Exercise standards: a statement for healthcare professionals from the American Heart Association. Circulation 1995;91:580-615.).

Surgery-Specific Risk

Surgery-specific cardiac risk of noncardiac surgery is related to 2 important factors: the type of surgery itself and the degree of hemodynamic stress associated with the procedures. The duration and intensity of coronary and myocardial stressors can be helpful in estimating the likelihood of perioperative cardiac events, particularly for emergency surgery. Surgery-specific risk for noncardiac surgery can be stratified as high, intermediate, and low (see Table 3, below).

Table 3. Cardiac Risk* Stratification for Noncardiac Surgical Procedures

- High (Reported cardiac risk often greater than 5%)
  - Emergent major operations, particularly in the elderly
  - Aortic and other major vascular surgery
  - Peripheral vascular surgery
  - Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss
- Intermediate (Reported cardiac risk generally less than 5%)
  - Carotid endarterectomy
  - Head and neck surgery
  - Intraperitoneal and intrathoracic surgery
  - Orthopedic surgery
  - Prostate surgery
- Low** (Reported cardiac risk generally less than 1%)
  - Endoscopic procedures
  - Superficial procedure
  - Cataract surgery
  - Breast surgery

*Combined incidence of cardiac death and nonfatal myocardial infarction.
**Do not generally require further preoperative cardiac testing.

An algorithm for the Stepwise Approach to Preoperative Cardiac Assessment is available from the American College of Cardiology Web site. The following steps correspond to that algorithm:

Step 1. What is the urgency of noncardiac surgery? Certain emergencies do not allow time for preoperative cardiac evaluation. Postoperative risk stratification may be appropriate for some patients who have not had such an assessment before.

Step 2. Has the patient undergone coronary revascularization in the past 5 years? If so, and if clinical status has remained stable without recurrent symptoms/signs of ischemia, further cardiac testing is generally not necessary.

Step 3. Has the patient had a coronary evaluation in the past 2 years? If coronary risk was adequately assessed and the findings were favorable, it is usually not necessary to repeat testing unless the patient has experienced a change or new symptoms of coronary ischemia since the previous evaluation.

Step 4. Does the patient have an unstable coronary syndrome or a major clinical predictor of risk? When elective noncardiac surgery is being considered, the presence of unstable coronary disease, decompensated heart failure, symptomatic arrhythmias, and/or severe valvular heart disease usually leads to cancellation or delay of surgery until the problem has been identified and treated.

Step 5. Does the patient have intermediate clinical predictors of risk? The presence or absence of prior MI by history or ECG, angina pectoris, compensated or prior heart failure, preoperative creatinine greater than or equal to 2 mg per deciliter, and/or diabetes mellitus helps to further stratify clinical risk for perioperative coronary events. Consideration of functional capacity and level of surgery-specific risk allows a rational approach to identify patients most likely to benefit from further noninvasive testing.

Step 6. Patients without major but with intermediate predictors of clinical risk and moderate or excellent functional capacity can generally undergo intermediate-risk surgery with little likelihood of perioperative death or MI. Conversely, further noninvasive testing is often considered for patients with poor functional capacity or moderate functional capacity but higher-risk surgery, especially for patients with 2 or more intermediate predictors of risk.

Step 7. Noncardiac surgery is generally safe for patients with neither major nor intermediate predictors of clinical risk and moderate or excellent functional capacity (4 METs or greater). Additional testing may be considered on an individual basis for patients without clinical markers but with poor functional capacity who are facing higher-risk operations, particularly those with several minor clinical predictors of risk who are scheduled to undergo vascular surgery.

Step 8. The results of noninvasive testing can be used to determine the need for additional preoperative testing and treatment. In some patients with documented CAD, the risk of coronary intervention or corrective cardiac surgery may approach or even exceed the risk of the proposed noncardiac surgery. This approach may be appropriate, however, if it significantly improves the patient's long-term prognosis.

For some patients, a careful consideration of clinical, surgery-specific, and functional status attributes leads to a decision to proceed to coronary angiography.

Management of Specific Preoperative Cardiovascular Conditions

Hypertension

Stage 3 hypertension (systolic blood pressure greater than or equal to 180 mmHg and diastolic blood pressure greater than or equal to 110 mmHg) should be controlled before surgery. In many such instances, establishment of an effective regimen can be achieved over several days to weeks of preoperative outpatient treatment. If surgery is more urgent, rapid-acting agents can be administered that allow effective control in a matter of minutes or hours. Beta-blockers appear to be particularly attractive agents. Continuation of preoperative antihypertensive treatment through the perioperative period is critical.

Valvular Heart Disease

Indications for evaluation and treatment of valvular heart disease are identical to those in the nonpreoperative setting. Symptomatic stenotic lesions are associated with risk of perioperative heart failure or shock and often require percutaneous valvotomy or valve replacement before noncardiac surgery to lower cardiac risk. Symptomatic regurgitant valve disease is usually better tolerated perioperatively and may be stabilized preoperatively with intensive medical therapy and monitoring. Regurgitant valve disease can then be treated definitively with valve repair or replacement after noncardiac surgery. Medical therapy and monitoring are appropriate when a delay of several weeks or months before noncardiac surgery may have severe consequences. Exceptions may include severe valvular regurgitation with reduced left ventricular function, in which overall hemodynamic reserve is so limited that destabilization during perioperative stresses is likely.

Myocardial Disease

Dilated and hypertrophic cardiomyopathy are associated with an increased incidence of perioperative heart failure. Management is aimed at maximizing preoperative hemodynamic status and providing intensive postoperative medical therapy and surveillance. An estimate of hemodynamic reserve is useful for anticipating potential complications from intraoperative or postoperative stress.

Arrhythmias and Conduction Abnormalities

The presence of an arrhythmia or cardiac conduction disturbance should provoke a careful evaluation for under-lying cardiopulmonary disease, drug toxicity, or metabolic abnormality. Therapy should be initiated for symptomatic or hemodynamically significant arrhythmias, first to reverse an underlying cause and second to treat the arrhythmia. Indications for antiarrhythmic therapy and cardiac pacing are identical to those in the nonoperative setting. Frequent ventricular premature beats and/or asymptomatic nonsustained ventricular tachycardia have not been associated with an increased risk of nonfatal MI or cardiac death in the perioperative period, and therefore, aggressive monitoring or treatment in the perioperative period generally is not necessary.

Implantable Pacemakers or Implantable Cardioverter Defibrillators (ICDs)

The type and extent of evaluation of a pacemaker or implantable cardioverter defibrillator depend on the urgency of the surgery, whether a pacemaker has unipolar or bipolar leads, whether electrocautery is bipolar or unipolar, the distance between electrocautery and pacemaker, and pacemaker dependency. ICD devices should be programmed off immediately before surgery and then on again postoperatively.

Supplemental Preoperative Evaluation

Specific recommendations for supplemental preoperative evaluation must be individualized to each patient and circumstance. The following may be appropriate in specific situations: assessment of resting left ventricular function, exercise

stress testing, pharmacological stress testing, ambulatory ECG monitoring, and coronary angiography. In most ambulatory patients, the test of choice is exercise ECG testing, which can both provide an estimate of functional capacity and detect myocardial ischemia through changes in the ECG and hemodynamic response. In patients with important abnormalities on their resting ECG (e.g., left bundle-branch block, left ventricular hypertrophy with strain pattern, or digitalis effect), other techniques such as exercise echocardiography or exercise myocardial perfusion imaging should be considered. Recommendations regarding individual testing modalities are given below.

Recommendations for Preoperative Noninvasive Evaluation of Left Ventricular Function

Class I. Patients with current or poorly controlled heart failure. (If previous evaluation has documented severe left ventricular dysfunction, repeat preoperative testing may not be necessary.)

Class IIa. Patients with prior heart failure and patients with dyspnea of unknown origin.

Class III. As a routine test of left ventricular function in patients without prior heart failure.

Recommendations for Preoperative 12-Lead Rest ECG

Class I. Recent episode of chest pain or ischemic equivalent in clinically intermediate- or high-risk patients scheduled for an intermediate- or high-risk operative procedure.

Class IIa. Asymptomatic persons with diabetes mellitus.

Class IIb.

1. Patients with prior coronary revascularization.
2. Asymptomatic male more than 45 years old or female more than 55 years old with 2 or more atherosclerotic risk factors.
3. Prior hospital admission for cardiac causes.

Class III. As a routine test in asymptomatic subjects undergoing low-risk operative procedures.

Recommendations for Exercise or Pharmacological Stress Testing

Class I.

1. Diagnosis of adult patients with intermediate pretest probability of CAD.
2. Prognostic assessment of patients undergoing initial evaluation for suspected or proven CAD; evaluation of subjects with significant change in clinical status.
3. Demonstration of proof of myocardial ischemia before coronary revascularization.

4. Evaluation of adequacy of medical therapy; prognostic assessment after an acute coronary syndrome (if recent evaluation unavailable).

Class IIa. Evaluation of exercise capacity when subjective assessment is unreliable.

Class IIb.

1. Diagnosis of CAD patients with high or low pretest probability: those with resting ST depression less than 1 mm, those undergoing digitalis therapy, or those with ECG criteria for left ventricular hypertrophy.
2. Detection of restenosis in high-risk asymptomatic subjects within the initial months after percutaneous coronary intervention (PCI).

Class III.

1. For exercise stress testing, diagnosis of patients with resting ECG abnormalities that preclude adequate assessment (e.g., pre-excitation syndrome, electronically paced ventricular rhythm, rest ST depression greater than 1 mm, or left bundle-branch block).
2. Severe comorbidity likely to limit life expectancy or candidacy for revascularization.
3. Routine screening of asymptomatic men or women.
4. Investigation of isolated ectopic beats in young patients.

Recommendations for Coronary Angiography in Perioperative Evaluation Before (or After) Noncardiac Surgery

Class I. Patients With Suspected or Known CAD

1. Evidence for high risk of adverse outcome based on noninvasive test results.
2. Angina unresponsive to adequate medical therapy.
3. Unstable angina, particularly when facing intermediate-risk* or high-risk* noncardiac surgery.
4. Equivocal noninvasive test results in patients at high clinical risk** undergoing high-risk* surgery.

Class IIa.

1. Multiple markers of intermediate clinical risk** and planned vascular surgery (noninvasive testing should be considered first).
2. Moderate to large ischemia on noninvasive testing but without high-risk features and lower left ventricular ejection fraction.
3. Nondiagnostic noninvasive test results in patients at intermediate clinical risk** undergoing high-risk* noncardiac surgery.
4. Urgent noncardiac surgery while convalescing from acute MI.

Class IIb.

1. Perioperative MI.

2. Medically stabilized class III or IV angina and planned low-risk or minor* surgery.

Class III.

1. Low-risk* noncardiac surgery with known coronary artery disease (CAD) and no high-risk results on noninvasive testing.
2. Asymptomatic after coronary revascularization with excellent exercise capacity (greater than or equal to 7 METs).
3. Mild stable angina with good left ventricular function and no high-risk noninvasive test results.
4. Noncandidate for coronary revascularization owing to concomitant medical illness, severe left ventricular dysfunction (e.g., left ventricular ejection fraction less than 0.20), or refusal to consider revascularization.
5. Candidate for liver, lung, or renal transplant less than 40 years old, as part of evaluation for transplantation, unless noninvasive testing reveals high risk for adverse outcome.

*Cardiac risk according to type of noncardiac surgery. High risk: emergent major operations, aortic and major vascular, peripheral vascular, or anticipated prolonged surgical procedure associated with large fluid shifts and blood loss; intermediate risk: carotid endarterectomy, major head and neck, intraperitoneal and intrathoracic, orthopedic, prostate; and low risk: endoscopic procedures, superficial procedures, cataract, or breast.

**Cardiac risk according to clinical predictors of perioperative death, MI, or heart failure. High clinical risk: unstable angina, acute or recent MI, and evidence of important residual ischemic risk, decompensated heart failure, high degree of atrioventricular block, symptomatic ventricular arrhythmias with known structural heart disease, severe symptomatic valvular heart disease, patient with multiple intermediate-risk markers such as prior MI, heart failure, and diabetes; intermediate clinical risk: Canadian Cardiovascular Society class I or II angina, prior MI by history or ECG, compensated or prior heart failure, diabetes mellitus or renal insufficiency.

Perioperative Therapy or Previous Coronary Revascularization

Coronary Artery Bypass Grafting

Indications for coronary artery bypass grafting (CABG) before noncardiac surgery are identical to those reviewed in the American College of Cardiology/American Heart Association guidelines for coronary artery bypass grafting. Coronary artery bypass grafting is rarely indicated simply to "get a patient through" noncardiac surgery. Patients undergoing elective noncardiac procedures who are found to have prognostic high-risk coronary anatomy and in whom long-term outcome would likely be improved by coronary artery bypass grafting should generally undergo revascularization before a noncardiac elective surgical procedure of high or intermediate risk (see Table 3, above).

Percutaneous Coronary Intervention (PCI)

Until further data are available, indications for PCI in the perioperative setting are similar to those in the American College of Cardiology/American Heart Association guidelines for use of PCI in general (See the National Guideline Clearinghouse (NGC) summary ACC/AHA/SCAI 2005 guideline update for percutaneous coronary intervention. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines.) There is uncertainty regarding how much time should pass between percutaneous coronary intervention and noncardiac procedures. Delaying surgery for at least 1 week after balloon angioplasty to allow for healing of the vessel injury has theoretical benefits. If a coronary stent is used, a delay of at least 2 weeks and ideally 4 to 6 weeks should occur before noncardiac surgery to allow 4 full weeks of dual antiplatelet therapy and re-endothelialization of the stent to be completed, or nearly so.

Perioperative Medical Therapy (2006 Update)

Since the publication of the previous guidelines on perioperative cardiovascular evaluation for noncardiac surgery in 2002, the issue of perioperative beta blockade for non-cardiac surgery has taken on increased importance. Specifically, the Physicians Consortium for Performance Improvement and the Surgical Care Improvement Project have both identified perioperative beta blockade as a quality measure. Given the importance of these quality measures for both public reporting and eventual pay-for-performance, and the recent series of publications on the subject, it became imperative to update the recommendations related to beta blockade. Therefore, the ACC/AHA Task Force on Practice Guidelines has chosen to expedite the review of the literature on perioperative beta blockade in order to produce recommendations that can be used in these national quality initiatives. The 2006 recommendations provided below replace the beta-blocker section in the 2002 guideline.

Perioperative Beta-Blocker Therapy

Class I.

1. Beta blockers should be continued in patients undergoing surgery who are receiving beta-blockers to treat angina, symptomatic arrhythmias, hypertension, or other ACC/AHA Class I guideline indications. (Level of Evidence: C)
2. Beta blockers should be given to patients undergoing vascular surgery at high cardiac risk owing to the finding of ischemia on preoperative testing. (Level of Evidence: B)

Class IIa

1. Beta blockers are probably recommended for patients undergoing vascular surgery in whom preoperative assessment identifies coronary heart disease. (Level of Evidence: B)
2. Beta blockers are probably recommended for patients in whom preoperative assessment for vascular surgery identifies high cardiac risk as defined by the presence of multiple clinical risk factors.* (Level of Evidence: B)
3. Beta blockers are probably recommended for patients in whom preoperative assessment identifies coronary heart disease or high cardiac risk as defined

by the presence of multiple clinical risk factors* and who are undergoing intermediate- or high-risk procedures as defined in these guidelines. (Level of Evidence: B)

Class IIb.

1. Beta blockers may be considered for patients who are undergoing intermediate- or high-risk procedures as defined in these guidelines, including vascular surgery, in whom preoperative assessment identifies intermediate cardiac risk as defined by the presence of a single clinical risk factor.* (Level of Evidence: C)
2. Beta blockers may be considered in patients undergoing vascular surgery with low cardiac risk (as defined in these guidelines) who are not currently on beta blockers. (Level of Evidence: C)

Class III. Beta blockers should not be given to patients undergoing surgery who have absolute contraindications to beta blockade. (Level of Evidence: C)

*Please see Table 1 above, "Clinical Predictors of Increased Perioperative Cardiovascular Risk," for an explanation of the clinical risk factors. High cardiac risk includes patients with major and intermediate clinical predictors. Care should be taken in applying recommendations on beta-blocker therapy to patients with decompensated heart failure, nonischemic cardiomyopathy, high-degree AV block, or severe valvular heart disease in the absence of coronary heart disease.

Perioperative Medical Therapy (2002 Guideline)

Perioperative Alpha-2 Agonists

Class IIb. Alpha-2 agonist: perioperative control of hypertension, or known CAD or major risk factors for CAD.

Class III. Alpha-2 agonists: contraindication to alpha-2 agonists.

Anesthetic Considerations and Intraoperative Management

Anesthetic Agent

All anesthetic techniques and drugs have known cardiac effects that should be considered in the perioperative plan. There appears to be no one best myocardium-protective anesthetic technique. Therefore, the choice of anesthesia and intraoperative monitors is best left to the discretion of the anesthesia care team, which will consider the need for postoperative ventilation, cardiovascular effects (including myocardial depression), sympathetic blockade, and dermatomal level of the procedure. Advocates of monitored anesthesia, in which local anesthesia is supplemented by intravenous sedation/analgesia, have argued that use of this technique avoids the undesirable effects of general or neuraxial techniques, but no studies have established this. Failure to produce complete local anesthesia/analgesia can lead to increased stress response and/or myocardial ischemia.

Perioperative Pain Management

Patient-controlled intravenous and/or epidural analgesia is a popular method for reducing postoperative pain. Several studies suggest that effective pain management leads to a reduction in postoperative catecholamine surges and hypercoagulability.

Intraoperative Nitroglycerin

There are insufficient data about the effects of prophylactic intraoperative intravenous nitroglycerin in patients at high risk. Nitroglycerin should be used only when the hemodynamic effects of other agents in use have been considered.

Recommendations for Intraoperative Nitroglycerin

Class I. High-risk patients previously taking nitroglycerin who have active signs of myocardial ischemia without hypotension.

Class IIb. As a prophylactic agent for high-risk patients to prevent myocardial ischemia and cardiac morbidity, particularly in those who have required nitrate therapy to control angina. The recommendation for prophylactic use of nitroglycerin must take into account the anesthetic plan and patient hemodynamics and must recognize that vasodilation and hypovolemia can readily occur during anesthesia and surgery.

Class III. Patients with signs of hypovolemia or hypotension.

Transesophageal Echocardiography

There are few data on the value of transesophageal echocardiography to detect transient wall motion abnormalities in predicting cardiac morbidity in noncardiac surgical patients. Experience to date suggests that the incremental value of this technique for risk prediction is small. Guidelines for appropriate use of transesophageal echocardiography have been published by the American Society of Anesthesiologists and the Society of Cardiovascular Anesthesiologists (Practice guidelines for perioperative transesophageal echocardiography: a report by the American Society of Anesthesiologists and the Society of Cardiovascular Anesthesiologists Task Force on Transesophageal Echocardiography. Anesthesiology 1996;84: 986-1006).

Perioperative Maintenance of Body Temperature

One randomized trial demonstrated a reduced incidence of perioperative cardiac events in patients who were maintained in a state of normothermia via forced-air warming compared with routine care.

Perioperative Surveillance

Pulmonary Artery Catheters

Although very few studies that have been reported compare patient outcomes after treatment with or without pulmonary artery catheters, 3 variables are particularly important in assessing benefit versus risk of pulmonary artery catheter use: disease severity, magnitude of anticipated surgery, and practice setting. The extent of expected fluid shifts is a primary concern. Patients most likely to benefit from perioperative use of a pulmonary artery catheter appear to be those with a recent myocardial infarction complicated by heart failure, those with significant CAD who are undergoing procedures associated with significant hemodynamic stress, and those with systolic or diastolic left ventricular dysfunction, cardiomyopathy, and/or valvular disease who are undergoing high-risk operations.

Intraoperative and Postoperative ST-Segment Monitoring

Intraoperative and postoperative ST changes indicating myocardial ischemia are strong predictors of perioperative myocardial infarction in patients at high risk who undergo noncardiac surgery. Similarly, postoperative ischemia is a significant predictor of long-term risk of myocardial infarction and cardiac death. Conversely, in patients at low risk who undergo noncardiac surgery, ST depression may occur and often is not associated with regional wall-motion abnormalities. Accumulating evidence suggests that proper use of computerized ST-segment analysis in appropriately selected patients at high risk may improve sensitivity for myocardial ischemia detection.

Recommendations for Perioperative ST-Segment Monitoring

Class IIa. When available, proper use of computerized ST-segment analysis in patients with known CAD or undergoing vascular surgery may provide increased sensitivity to detect myocardial ischemia during the perioperative period and may identify patients who would benefit from further postoperative and long-term interventions.

Class IIb. Patients with single or multiple risk factors for CAD.

Class III. Patients at low risk for CAD.

Surveillance for Perioperative MI

Few studies have examined the optimal method for diagnosing a perioperative MI. Clinical symptoms, postoperative ECG changes, and elevation of the MB fraction of creatine kinase (CK-MB) have been studied most extensively. Recently, elevations of myocardium-specific enzymes such as troponin-I, troponin-T, or CK-MB isoforms have also been shown to be of value (85 to 90). In patients with known or suspected CAD who are undergoing high-risk procedures, ECGs obtained at baseline, immediately after surgery, and on the first 2 days after surgery appear to be cost-effective. A risk gradient can be based on the magnitude of biomarker elevation, the presence or absence of concomitant new ECG abnormalities, hemodynamic instability, and quality and intensity of chest pain syndrome, if present. Use of cardiac biomarkers is best reserved for patients at high risk and those with clinical, ECG, or hemodynamic evidence of cardiovascular dysfunction.

Postoperative and Long-Term Management

Despite even optimal perioperative management, some patients will have perioperative MI, which is associated with a 40% to 70% mortality rate. For patients who experience a symptomatic perioperative ST-segment elevation MI as a result of sudden thrombotic coronary occlusion, angioplasty should be considered after the risks versus benefits have been weighed. Pharmacological therapy with aspirin should be initiated as soon as possible, and a beta-blocker and angiotensin converting enzyme inhibitor may also be beneficial. Perioperative MI carries a high risk for future cardiac events. Patients who sustain acute MI in the perioperative period should receive careful medical evaluation for residual ischemia and overall left ventricular function.

It is also appropriate to recommend secondary risk reduction in the relatively large number of elective surgery patients in whom cardiovascular abnormalities are detected during preoperative evaluations. Although the occasion of surgery is often taken as a specific high-risk time, most of the patients who have known or newly detected CAD during their preoperative evaluations will not have any events during elective noncardiac surgery. After the preoperative cardiac risk has been determined by clinical or noninvasive testing, most patients will benefit from pharmacological agents to lower low-density lipoprotein cholesterol levels, increase high-density lipoprotein levels, or both. On the basis of expert opinion, the goal should be to lower the low-density lipoprotein level to less than 100 mg per deciliter (2.6 mmol per deciliter).

American College of Cardiology/American Heart Association Classifications of Evidence:

Class I: Conditions for which there is evidence for and/or general agreement that the procedure or treatment is beneficial, useful, and effective

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of performing the procedure or treatment.

Class IIa: Weight of evidence/opinion is in favor of usefulness/efficacy.

Class IIb: Usefulness/efficacy is less well established by evidence/opinion.

Class III: Conditions for which there is evidence and/or general agreement that the procedure/treatment is not useful/effective and in some cases may be harmful.

2006 Update

For the 2006 update on beta-blockers, the weight of evidence in support of the recommendation is listed as follows:

- Level of Evidence A: Data derived from multiple, randomized, clinical trials.
- Level of Evidence B: Data derived from a single randomized trial or non-randomized studies.

- Level of Evidence C: Only consensus opinion of experts, case studies, or standard-of-care.

CLINICAL ALGORITHM(S)

Clinical algorithms are provided in the original guideline document for:

- Stepwise Approach to Preoperative Cardiac Assessment
- Supplemental Preoperative Evaluation

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation for beta-blocker use (see "Major Recommendations").

The type of evidence is not specifically stated for the other recommendations. Observational or retrospective data and expert opinion form the basis of the proposed algorithm for preoperative cardiac assessment. Data from observational studies for recommendations is compiled in six evidence tables in the original guideline document (see Tables 6 through 11).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Appropriate utilization of invasive and noninvasive tests to evaluate cardiac risk in patients undergoing noncardiac surgery
- Decreased perioperative risk and cardiovascular morbidity (e.g., myocardial infarction) and mortality

Perioperative Medical Therapy: Current studies suggest that beta blockers reduce perioperative ischemia and may reduce the risk of myocardial infarction and death in high-risk patients.

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These guidelines attempt to define practices that meet the needs of most patients in most circumstances. The ultimate judgment regarding the care of a particular patient must be made by the physician and patient in light of all the circumstances presented by that patient.

- While the collective knowledge surrounding the identification of high-and low-risk patients using perioperative clinical and noninvasive evaluation is substantial, very few prospective or randomized studies have been performed that establish the value of tests or treatments on perioperative outcome. Because the studies were rarely randomized controlled trials, definitions of a perioperative event varied, investigators were rarely blinded, and many inherent selection biases existed, the task force has chosen not to provide an aggregate synthesis of the data in the form of a point estimate or meta-analysis.

Limitations in the Perioperative Beta-Blocker Literature include:

- Most trials are inadequately powered.
- Few randomized trials of medical therapy to prevent perioperative major adverse cardiac events have been performed.
- Few randomized trials have examined titration of therapy to effect (e.g., target heart rate).
- Few randomized trials have examined the role of perioperative beta-blocker therapy.
- Studies to determine the role of beta blockers in intermediate- and low-risk populations are lacking.
- Studies to determine the optimal type of beta blockers are lacking.
- No studies have addressed care-delivery mechanisms in the perioperative setting, identifying how, when, and by whom perioperative beta-blocker therapy should be implemented and monitored.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Clinical Algorithm

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

American College of Cardiology Foundation (ACCF), American Heart Association (AHA). ACC/AHA guideline update on perioperative cardiovascular evaluation for noncardiac surgery. A report of the American College of Cardiology/American Heart Association Task Force on practice guidelines (Committee to Update the 1996 Guidelines). Bethesda (MD): American College of Cardiology Foundation; 2002. 58 p. [390 references]

Fleisher LA, Beckman JA, Freeman WK, Brown KA, Froeclich JB, Calkins H, Kasper EK, Chaikof E, Kersten JR, Fleischmann KE, Riegel B. ACC/AHA 2006 guideline update on perioperative cardiovascular evaluation on noncardiac surgery: focused update on perioperative beta-blocker therapy. A report of the American College of Cardiology/American Heart Association Task Force on Practice [trunc]. J Am Coll Cardiol 2006;47:1-12. [25 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

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GUIDELINE DEVELOPER(S)

American College of Cardiology Foundation - Medical Specialty Society
American Heart Association - Professional Association

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GUIDELINE COMMITTEE

2002 Guideline

Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery

2006 Addendum

Writing Committee to Update the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery

American College of Cardiology/American Heart Association Task Force on Practice Guidelines

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

2002 Guideline

Committee Members: Kim A. Eagle, MD, FACC, Chair; Peter B. Berger, MD, FACC; Hugh Calkins, MD, FACC; Bernard R. Chaitman, MD, FACC; Gordon A. Ewy, MD, FACC; Kirsten E. Fleischmann, MD, MPH, FACC; Lee A. Fleisher, MD, FACC; James B. Froehlich, MD, FACC; Richard J. Gusberg, MD, FACS; Jeffrey A. Leppo, MD, FACC; Thomas Ryan, MD, FACC; Robert C. Schlant, MD, FACC; William L. Winters, Jr, MD, MACC

Task Force Members: Raymond J. Gibbons, MD, FACC, Chair; Elliott M. Antman, MD, FACC, Vice Chair; Joseph S. Alpert, MD, FACC; David P. Faxon, MD, FACC; Valentin Fuster, MD, PhD, FACC; Gabriel Gregoratos, MD, FACC; Alice K. Jacobs, MD, FACC; Loren F. Hiratzka, MD, FACC; Richard O. Russell, MD, FACC*; Sidney C. Smith, Jr, MD, FACC

*Former Task Force member during the writing effort.

2006 Addendum

Committee Members: Lee A. Fleisher, MD, FACC, Chair; Joshua A. Beckman, MD, FACC; Kenneth A. Brown, MD, FACC, FAHA; Hugh Calkins, MD, FACC, FAHA; Elliott Chaikof, MD; Kirsten E. Fleischmann, MD, MPH, FACC; William K. Freeman, MD, FACC; James B. Froehlich, MD, MPH, FACC; Edward K. Kasper, MD, FACC; Judy R. Kersten, MD, FACC; Barbara Riegel, DNSC, RN, FAHA; John F. Robb, MD, FACC

Task Force Members: Sidney C. Smith, JR., MD, FACC, FAHA, Chair; Alice K. Jacobs, MD, FACC, FAHA, Vice-Chair; Cynthia D. Adams, MSN, APRN-BC, FAHA; Jeffrey L. Anderson, MD, FACC, FAHA; Elliott M. Antman, MD, FACC, FAHA*; David P. Faxon, MD, FACC, FAHA**; Valentin Fuster, MD, PHD, FACC, FAHA, FESC**; Jonathan L. Halperin, MD, FACC, FAHA; Loren F. Hiratzka, MD, FACC, FAHA**; Sharon A. Hunt, MD, FACC, FAHA; Bruce W. Lytle, MD, FACC, FAHA; Rick Nishimura, MD, FACC, FAHA; Richard L. Page, MD, FACC, FAHA; Barbara Riegel, DNSC, RN, FAHA

*Immediate Past Chair
**Former Task Force member during this writing effort

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The American College of Cardiology/American Heart Association (ACC/AHA) Task Force on Practice Guidelines makes every effort to avoid any actual, potential, or perceived conflict of interest that might arise as a result of an industry relationship or personal interest of the writing committee. Specifically, all members of the writing committee, as well as peer reviewers of the document, were asked to provide disclosure statements of all such relationships that might be perceived as real or potential conflicts of interest. These statements are reviewed by the parent task force, reported orally to all members of the writing

committee at each meeting, and updated and reviewed by the writing committee as changes occur.

Table: Author Relationships With Industry for the ACC/AHA Guideline Update on Perioperative Cardiovascular Evaluation for Noncardiac Surgery: Focused Update on Perioperative Beta-Blocker Therapy

Committee Member	Consultant	Research Grant	Scientific Advisory Board	Speakers' Bureau	Other
Joshua A. Beckman, MD	Bristol-Myers Squibb	None	Sanofi-Aventis	Bristol-Myers Squibb; Merck; Eli Lilly; Sanofi-Aventis	None
Kenneth A. Brown, MD	None	None	None	None	None
Hugh Calkins, MD	None	None	None	None	None
Elliot Chaikof, MD	None	None	None	None	None
Kirsten E. Fleischmann, MD, MPH	None	None	None	None	Pfizer (QI/CME Initiatives)
Lee A. Fleisher, MD	None	None	None	None	None
William K. Freeman, MD	None	None	None	None	None
James B. Froehlich, MD, MPH	Pfizer	None	Sanofi-Aventis	Sanofi-Aventis; Otsuka; Pfizer; Merck	None
Edward K. Kasper, MD	None	None	None	None	None
Judy R. Kersten, MD	Abbott Laboratories	Abbott Laboratories	None	Abbott Laboratories	None
Barbara Riegel, DNSc, RN	None	None	None	None	None
John F. Robb, MD	None	None	None	None	None

Table: External Peer Reviewer Relationships With Industry for the ACC/AHA Guideline Update on Perioperative Cardiovascular Evaluation for Noncardiac Surgery: Focused Update on Perioperative Beta-Blocker Therapy*

Peer Reviewer**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/Ad Board
Dr. Peter Alagona	Official Reviewer - Board of Trustees	None	None	None	None
Dr. Joseph Alpert	Official Reviewer - AHA Reviewer	None	None	None	None

Peer Reviewer**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/Ad Board
Dr. Vincent Carr	Official Reviewer - Board of Governors	None	None	None	None
Dr. Ray Gibbons	Official Reviewer - AHA Reviewer	Radiant Medical; Boston Scientific; Boehringer Ingelheim; Spectranetrics; KAI Pharmaceuticals; TargeGen; TherOx; King Pharmaceuticals	None	None	Hawaii Biotech; Cardiovascular C Studies (WOMEN study, TIMI 37 A Consumers Unio
Dr. Bruce Lytle	Official Reviewer - ACCF/AHA Task Force Practice Guidelines	None	None	Johnson & Johnson	None
Dr. Susan Begelmen	Organizational Reviewer-Society for Vascular Medicine and Biology (SVMB)	None	Bristol-Myers Squibb; Sanofi-Aventis; GlaxoSmithKline	None	Bristol-Myers Sc Sanofi-Aventis; GlaxoSmithKline
Dr. Simon Body	Organizational Reviewer-Society of Cardiovascular Anesthesiologists (SCA); Content Reviewer - AHA Council on Cardiopulmonary, Perioperative and Critical Care	None	None	None	None
Dr. Bengt Herweg	Organizational Reviewer-Heart Rhythm Society (HRS)	None	None	None	None
Dr. Scott Kinlay	Organizational Reviewer-SVMB	Pfizer	Pfizer; Merck	None	Pfizer
Dr. Richard Page	Organizational Reviewer - HRS; Content Reviewer - ACCF Clinical Electrophysiology Committee; Content Reviewer - AHA Council on Clinical Cardiology Electrocardiography and Arrhythmias Committee	None	None	None	Procter and Gam Pharmaceuticals

Peer Reviewer**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/Ad Board
Dr. Mark Turco	Organizational Reviewer - Society for Cardiovascular Angiography and Interventions (SCAI)	None	Boston Scientific Corp.; Medtronic	None	Boston Scientific Corp.; Medtronic
Dr. Neil Weissman	Organizational Reviewer - American Society of Echocardiography (ASE)	Edwards Life Sciences; Carbomedics; Wyeth; Bristol-Myers Squibb Medical Imaging; Cook Corp.; Boston Scientific; Arbor Surgical; Arena Pharmaceutical; Mitsubishi	None	None	Wyeth; Pfizer; B Myers Squibb M Imaging; Bostor Scientific
Dr. Kim Williams	Organizational Reviewer - American Society of Nuclear Cardiology (ASNC); Content Reviewer - ACCF Cardiovascular Clinical Imaging Committee	Bristol-Myers Squibb; CV Therapeutics	GE Healthcare; Astellas Pharma	None	GE Healthcare
Dr. Mazen Abu-Fadel	Content Reviewer - ACCF Cardiac Catheterization Committee	None	None	None	None
Dr. Ralph Bolman	Content Reviewer - AHA Council on Surgery and Anesthesia	None	None	None	None
Dr. Mark Carlson	Content Reviewer - ACCF Clinical Electrophysiology Committee	None	Medtronic	AtriCure, Inc	St. Jude; Guidar
Dr. Leslie Cho	Content Reviewer - ACCF Peripheral Vascular Disease Committee	Bristol-Myers Squibb; Aventis-Sanofi	Bristol-Myers Squibb; Aventis-Sanofi	None	None
Dr. Jose Diez	Content Reviewer - ACCF Cardiac Catheterization Committee	None	None	None	None
Dr. J. Kevin	Content Reviewer -	None	None	None	None

Peer Reviewer**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/Ad Board
Donahue	AHA Council on Clinical Cardiology Electrocardiography and Arrhythmias Committee				
Dr. Leonard Dreifus	Content Reviewer - ACCF Clinical Electrophysiology Committee	None	None	None	Merck
Dr. N.A. Mark Estes	Content Reviewer - AHA Council on Clinical Cardiology Electrocardiography and Arrhythmias Committee	None	Medtronic; Guidant; St. Jude Medical	None	Medtronic
Dr. A Marc Gillinov	Content Reviewer - AHA Council on Cardiovascular Surgery and Anesthesia	None	Edwards Life Sciences	None	AtriCure, Inc.
Dr. Loren Hiratzka	Content Reviewer - AHA Council on Cardiovascular Surgery and Anesthesia	None	None	None	None
Dr. Lawrence Katz	Content Reviewer - ACCF Echocardiography Committee	None	None	None	None
Dr. Smadar Kort	Content Reviewer - ACCF Echocardiography Committee	None	None	None	None
Dr. Peter Kowey	Content Reviewer - ACCF Clinical Electrophysiology Committee	None	None	None	None
Dr. Fred Krainin	Content Reviewer - ACCF Cardiac Catheterization Committee	None	None	Boston Scientific; Johnson & Johnson; Medtronic	None
Dr. Christopher Karmer	Content Reviewer - ACCF Cardiovascular Clinical Imaging Committee	Astellas; Novartis	GE Healthcare	None	GE Healthcare; Novartis
Dr. Jerrold Levy	Content Reviewer - AHA Council on	None	None	None	Bayer; Dyax

Peer Reviewer**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/Ad Board
	Cardiovascular Surgery and Anesthesiology				
Dr. M. Sean McMurry	Content Reviewer - AHA Council on Cardiopulmonary, Perioperative and Critical Care	None	None	None	None
Dr. Charanjit Rihal	Content Reviewer - ACCF Cardiac Catheterization Committee	Cardiac Dimensions	None	None	Millennium
Dr. Carlos Ruiz	Content Reviewer - ACCF Cardiac Catheterization Committee	None	None	None	None
Dr. Frank Sellke	Content Reviewer - AHA Council on Cardiovascular Surgery and Anesthesia	None	Bayer Corp.	None	CereMedix; Inot Corp.
Dr. Janet Wyman	Content Reviewer - ACCF Cardiac Catheterization Committee	None	None	None	None

This table represents the relationships of peer reviewers with industry that were disclosed at the time of peer review of this guideline. It does not necessarily reflect relationships with industry at the time of publication.

*Participation in the peer review process does not imply endorsement of the document.

**Names are listed in alphabetical order within category of review.

GUIDELINE STATUS

This is the current release of the guideline.

This guideline combined with the addended material, updates a previous version: Guidelines for perioperative cardiovascular evaluation for noncardiac surgery: report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 1996 Jun;27[4]:910-48.

GUIDELINE AVAILABILITY

Electronic copies of the 2002 guideline: Available in Portable Document Format (PDF) from the American College of Cardiology (ACC) Web site; electronic copies are also available in PDF from the American Heart Association (AHA) Web site.

Electronic copies of the 2006 update: Available in Portable Document Format (PDF) from the American College of Cardiology (ACC) Web site; electronic copies are also available in PDF from the American Heart Association (AHA) Web site

Print copies: Available from the American College of Cardiology, Resource Center, 9111 Old Georgetown Rd, Bethesda, MD 20814-1699; (800) 253-4636 (US only).

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on June 30, 1998. The information was verified by the guideline developer on December 1, 1998. This summary was updated by ECRI on April 30, 2002. The updated information was verified by the guideline developer on August 7, 2002. This NGC summary was updated on May 12, 2006. The updated information was verified by the guideline developer on June 15, 2006.

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